FINVAC
The Finnish Association of HVAC Societies

Rakennusten energiaseminaari 2014

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Rakennusten energiatehokkuus-direktiiviä tukevat uusitut CEN standardit

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EU Mandate (M480) for CEN to develop the second generation CEN-EPBD standards

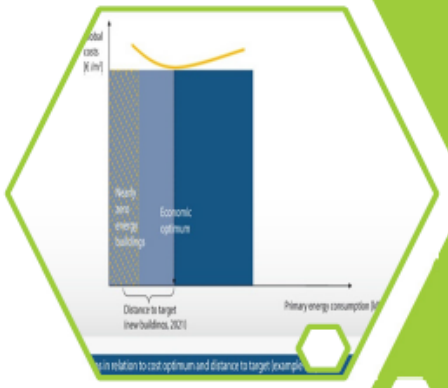
- The set of 40-50 standards under development
- CEN TC 371 ‘Energy performance of building project group’ coordinates the work with five committees:
  - TC 89, Thermal performance of buildings and building components
  - TC 228, Heating systems in buildings
  - TC 156, Ventilation for buildings
  - TC 247, Building automation, controls, and building management
  - TC 169, Light and lighting
- Communication with the regulators of the EU- member states via the Liaison Committee
- Standards will include a format for national annexes where MS have to report national options and input data

European Commission

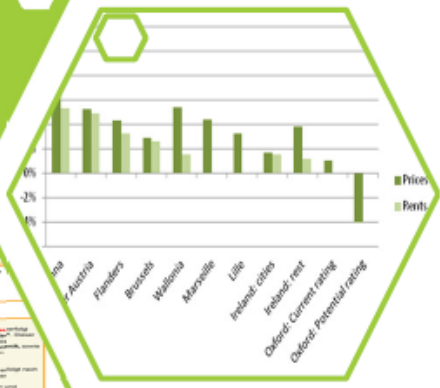
Making the EPBD pieces fit together

COST OPTIMAL REPORTS

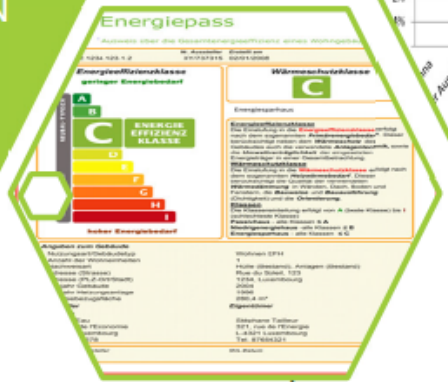
EU CERTIFICATION SCHEME NON-RESIDENTIAL BUILDINGS



EPBD-STANDARDISATION



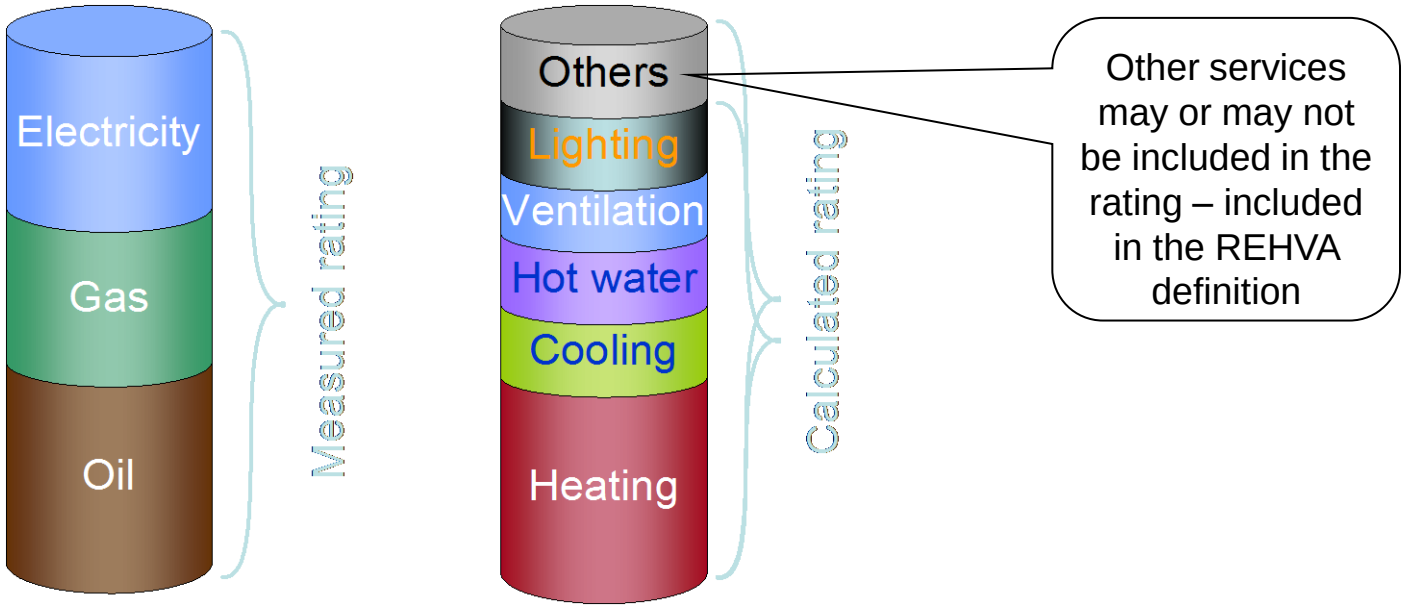
NZEB



EPBD definition for energy performance

EPBD definitions (article 2):

- ‘energy performance of a building’ means the calculated or measured amount of energy needed to meet the energy demand associated with a typical use of the building, which includes, **inter alia**, energy used for **heating, cooling, ventilation, hot water and lighting**



Region	Country	nZEB Energy performance					RES	
		Values	Unit	Metric	Energy uses for:	Building type	EP calculation	nZEB req.
Zone 1-2 (Catania, Athens)	Cyprus	180 210	kWh/m^2/y	Primary energy	heating, cooling, hot water, lighting	Residential Non-residential	No No	25% 25%
Zone 3 (Budapest, Bratislava, Ljubjana)	Slovakia	54 32 60	kWh/m^2/y	Primary energy	Heating, hot water, ventilation, cooling (non-res), lighting (non-res)	Detached Apartment Offices	N.a. N.a. N.a.	50% 50% 50%
Zone 4 (Paris, Amsterdam Berlin, Brussels, Copenhagen, Dublin, London, Macon, Nancy, Prague, Warsaw)	Belgium BXL	45 95 - 2,5*(V/S)	kWh/m^2/y	Primary energy	heating, cooling (non-res), hot water, lighting (non-res), auxiliary electricity	Residential Offices, educational	Yes Yes	- -
	Belgium Walloon	60	kWh/m^2/y	Primary energy	heating, hot water, auxiliary electricity	Residential and non-res.	N.a.	50%
	Belgium Flemish	30 40	kWh/m^2/y	Energy use	Heating, cooling, hot water, ventilation, auxiliary systems	Residential Office and school	Yes Yes	>10 kWh/m^{2}y >10 kWh/m^{2}y
	France	50 70 110	kWh/m^2/y	Primary energy	heating, ventilation, cooling, hot water, lighting, auxiliary systems	Residential Office Office AC	No No No	- - -
	Ireland	45	kWh/m^2/y	Energy load	heating, ventilation, hot water, lighting	Residential	N.a.	-
	Netherlands	0	[-]	Energy perform. coefficient (EPC)	heating, ventilation, cooling, hot water, lighting	Residential/ non-residential	Yes Yes	- -

Region	Country	nZEB Energy performance					RES	
		Values	Unit	Metric	Energy uses for:	Building type	EP calculation	nZEB req.
Zone 5 (Coopenhagen, Tallinn, Helsinki, Riga, Stockholm, Gdansk, Tovarene)	Denmark	20 25	kWh/m²/y	Primary energy	heating, cooling, ventilation, hot water, lighting (non-res)	Residential Non-residential	Yes Yes	51-56% 51-56%
	Estonia	50 100 100 130	kWh/m²/y	Primary energy	heating, ventilation, cooling, hot water, lighting, auxiliary electricity, appliances	Detached house Apartment Office Hotel	Yes Yes Yes Yes	- - - - -
	Latvia	95	kWh/m²/y	Primary energy	heating, cooling, domestic hot water, ventilation, lighting	Residential/ non-residential	N.a.	-
	Lithuania	<0,25	[-]	Energy perfor-mance indicator C	heating	Residential/ not-residential	N.a.	50%

Data from CA EPBD Oct 2013 (Kurnitski et al. REHVA Journal 2/2014)

nZEB requirements up today

- National nZEB applications show remarkably high variation between 20 and 200 kWh/m²y primary energy in ten countries:
  - caused partly due to different energy uses included and partly due to different level of ambition in the definitions
  - exclusion of the energy flows leads to situation where calculated energy use could represent only a small fraction of measured energy use in real buildings
- Requirements only for residential and non-residential show that majority of countries cannot tackle the eight building types specified in EPBD recast Annex
- nZEB primary energy values showed a **reduction by factor of 1.6 in Estonia and by 2 in Denmark** compared to current EP minimum requirements of office buildings (reduction of **40-50%**)

Phase 1 results

- **FprEN 15603:2014 Over-Arching EPB Standard**
- **draft-prTR (Technical Report) 15615:2014 on the prEN 15603**

- **FprEN 15603:2014 was disapproved in the voting 10/2014, needs revision and resubmission**

EXCEL files to support the checking of the calculation procedures as given in the FprEN15603 and generating the examples in the TR

A complex OA structure is needed
Because:... this is what we are calculating






Small existing building?

You just calculate it as one single piece

...as you would eat a small pastry in one single bite..

= no partitioning required

Big building, arcade + office + residential?

… but what if there is a big cake on the table?
You have to eat it slice by slice …
→ Partitioning required for complex buildings!

High performance

- **Hourly method as the main method**
- **Monthly methods also included**
- **In general, many options – only way to achieve European consensus**

The amount of energy involved is so small that any interaction may be relevant.

Example domestic hot water losses and cooling…

Also localization of gains is relevant.

Will Solar gains of the big window in the living facing south effectively heat upstairs north rooms?

Thermal zones or even room by room calculation may be required…

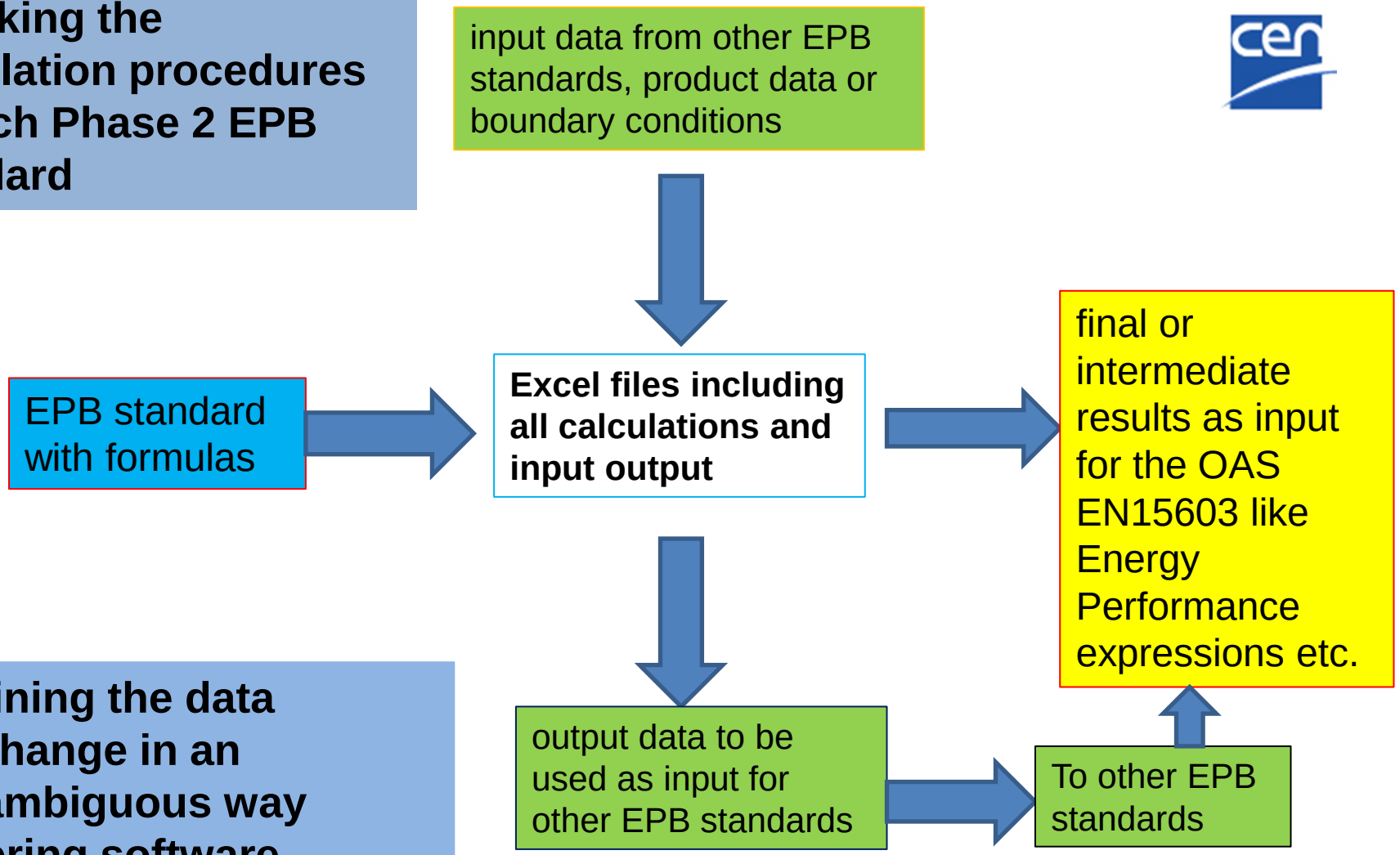
Status/Planning M480-Phase 2

- most draft prEN's are ready and have been published as N-doc's at the CENTC371 livelink
- **September-December 2014** publication of the prEN's for enquiry
- It is expected to reach and possibly finish the enquiry stage of all EPB-standards around **April-May 2015**
- **Before the end of 2015** we expect all Enquiry comments to be resolved and Formal Vote versions ready at TC level.
- After publishing and voting we expect that **during 2016 all EPB-standards will ready and available as EN** (or EN-ISO) standards

Example case to promote the total set of EPBD standards

- MS's ask CEN to produce example of real building + systems to illustrate that the set works
- Experts and task leaders of the different TC's may be requested to contribute to this
- CEN have to put energy on promoting the use of their standards at MS level

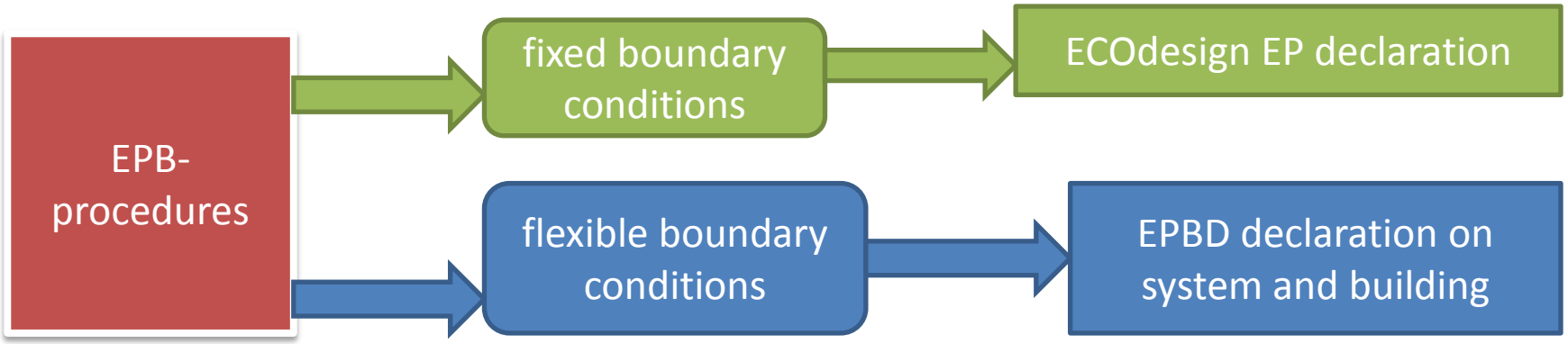
Checking the calculation procedures in each Phase 2 EPB standard



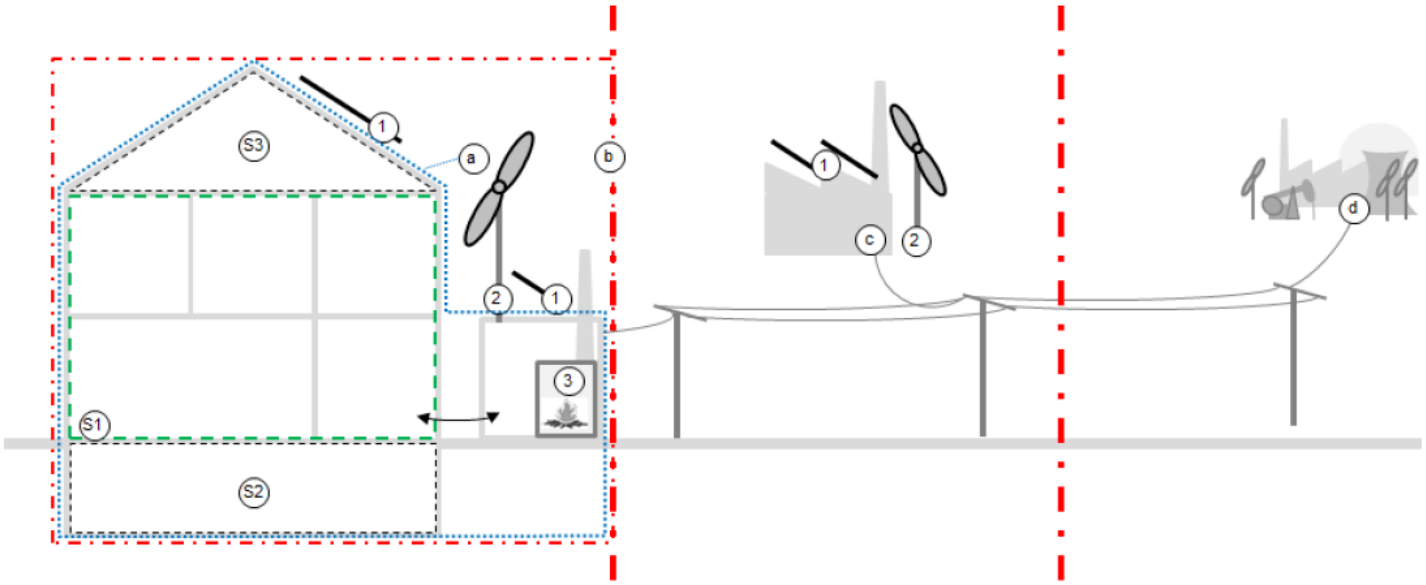
defining the data exchange in an unambiguous way offering software developers a clear interpretation how standards shall be used

Building and system EP: also depending on product EP: relation to the ECO-DESIGN Directive and connected M495

- Ecodesign EP assessment procedures have been developed independently – the **result of not using the EPB** procedures for the Ecodesign EP assessment is not predictable.
- Using Ecodesign-EP declared values as input for EPB system assessment procedures may lead to misleading EPBD declarations.
- **Ideal situation: USE EPB Procedures:**



FprEN 15603:2014 Over-Arching EPB Standard 7.5 Assessment boundaries and perimeters



Key

a	Assessment boundary (use energy balance)	S1	Thermally conditioned space	1	PV
				2	Wind
b	On-site	S2,	Space outside thermal envelope		
c	Nearby	S3	Boiler room		
d	Distant				

- Kansallisilla valinnoilla verkkoon syöttäminen voidaan mahdollistaa tai ei – monia muitakin kansallisia valintoja

7.7 Share of renewable energy (=REHVA)

The renewable energy ratio RER is given by:

$$RER = \frac{E_{\text{Pren;RER}}}{E_{\text{Ptot}}} \quad (2)$$

where:

E_{Ptot} is the total primary energy calculated with equation (1) using total primary conversion factors $f_{\text{Ptot;del;cr,}i}$ and $f_{\text{Ptot;exp;cr,}i}$.

$E_{\text{Pren;RER}}$ is the renewable primary energy calculated with equation (1) in 7.6.1, taking into account the perimeters defined in Table A9;

FprEN 15603:2014 Annex G (informative) Definition of nearly Zero-Energy Buildings (nZEB)

- **G.1 General principles**
- The use of only one requirement, e.g. the numeric indicator of primary energy use, is misleading. Different requirements are combined to a coherent assessment of a nearly Zero-Energy Building (nZEB).
- **G.2 First requirement: The building fabric (Energy needs)**
- **G.3 Second requirement: The total primary energy use**
- **G.4 Third requirement: Non-renewable primary energy use without compensation between energy carriers**
- **G.5 Final nZEB rating: Numerical indicator of non-renewable primary energy use with compensation**

The CEN proposal for nZEB: a hurdle race

Start

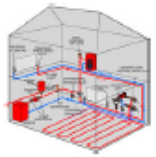
Arrival

Hurdle 1:
Building needs

Conditioned space

Hurdle 2:
Building use
Total primary energy

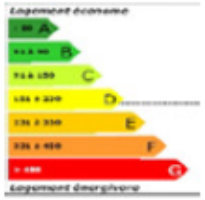
Technical building systems



Hurdle 3:
Building use
Non-renewable prim. energy

Energy carriers

nZEB rating
Primary energy balance

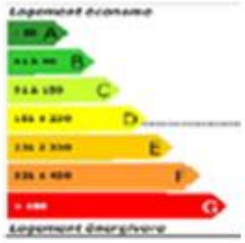


Delivered - Exported

Evolution of assessment boundaries

nZEB rating
non-renewable primary energy with compensation

Primary energy balance



Final nZEB rating
= REHVA definition
= requirements in use in many MS

Delivered - Exported

At this stage the compensation between energy carriers and the effect of exported energy is taken into account.

The numerical indicator of non-renewable primary energy is calculated according to 7.6 (step B).

Johtopäätökset

- 40-50 uusittua EPBD standardia käytössä 2016, mm. 15603 OAS, sisäilmastostandardi 15251, 13779 ym., valtaosa standardeista saa uuden numeron
- Standardeja on perinteisesti hyödynnetty kansallisia laskentamenetelmiä kehitettäessä, mutta nyt komission toimesta EN standardien roolia halutaan vahvistaa energialaskennan harmonisointia varten
- Uusia elementtejä standardien valmistelussa:
  - tuntitason laskentamenetelmät korostetusti esillä
  - kansallisesti valitut parametrit julkaistava kansallisina liitteinä
  - kommunikointi kansallisten lainsäätäjien kanssa ja rakennusten energialaskentaesimerkkien laatiminen
- Kommentointivaihe 4-5/2015 asti ja formal vote versioiden valmistelu 12/2015 mennessä voivat olennaisesti kehittää nykyisiä luonnoksia